Nanoobjects microscopy

Surface segregation in amorphous alloys FINEMET at different types of deformation

V.A. Tinkov[1], M.O. Vasylyev[1], S.M. Voloshko[2], A.S. Khodakivskyi[1]

[1] *G. V. Kurdyumov Institute for Metal Physics of NAS of Ukraine, Kiev, Kiev-142, Ukraine.*

[2] *National Technical University of Ukraine "KPI",Kiev, Ukraine*

Influence of various types of plastic deformation in air at room temperature, such as ultrasonic impact treatment (USIT), bend on the mandrel at different angles and diamond pyramid indentation on changes of surface composition of amorphous $Fe_{73.6}Si_{15.8}B_{7.2}Cu_{1.0}Nb_{2.4}$ ribbons (FINEMET) was investigated by means of scanning electron microscopy. The effects of strain-induced surface segregation of elements were found in the amorphous $Fe_{73.6}Si_{15.8}B_{7.2}Cu_{1.0}Nb_{2.4}$ ribbon at different types of plastic deformation. It was established that during deformation the concentration changes are related with a substantial reconstruction of atomic structure and the driving forces behind the migration of elements can be both stress gradients and concentration gradients in the amorphous ribbon.

Behavior of only two elements in all kinds of deformation is identical. B concentration increases and Si atoms decreases (relative to the composition of the amorphous ribbon in initial state). The remaining components of the alloy tends to increase or decrease with increasing amount of mechanical stress on the amorphous ribbon.

The concentration changes observed, apparently associated with a significant atomic restructuring of amorphous ribbon in different types of deformation.

The stress gradients and concentration gradients can be main forces of migration of elements in the amorphous ribbon due to the deformation nanocrystallization process. As migrating particles can have different atomic configurations: as clusters of metal-metalloid, metalloid-metalloid and metal-metal; as individual atoms of the amorphous matrix or of the least stable clusters which was broken during deformation.